Technical Evaluation Report

TO ASSIST WITH CODE COMPLIANCE

Celect Cellular Exteriors Cladding & Trim **TER No. 1305-01**

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Royal Building Products
30 Royal Group Crescent
Woodbridge, Ontario L4H 1X9 Canada
800-461-0849 (fax)
celect.royalbuildingproducts.com

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION
Section: 07 46 00 – Siding
Section: 07 46 33 – Plastic Siding

1. Product Evaluated:

1.1. Celect Cellular Exteriors Cladding

2. Applicable Codes and Standards:[1]

2.1. *2006*, *2009* and *2012 International Building Code* (*IBC*)

2.2. *2006, 2009 and 2012 International Residential Code* (*IRC*)

2.3. *2010 Florida Building Code* (*FBC*)[2]

2.4. *ASTM D3679-09a – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding*

2.5. *ASTM D5206-06a – Standard Test Method for Windload Resistance of Rigid Plastic Siding*

2.6. *ASTM D635-10 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position*

2.7. *ASTM D638-10 – Standard Test Method for Tensile Properties of Plastics*

2.8. *ASTM D648-07 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position*

2.9. *ASTM D696-08 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between −30°C and 30°C with a Vitreous Silica Dilatomet*

[1] Unless otherwise noted, code references are from the 2012 versions of the codes. This product is also approved for use with the 2000 and 2003 versions of the *IBC* and *IRC* and the standards referenced therein.
[2] Unless otherwise noted, *IBC* reference numbers are the same as the *FBC* references

2.10. *ASTM D790-10 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials*

2.11. *ASTM D2240-05 (2010) – Standard Test Method for Rubber Property—Durometer Hardness*

2.12. *ASTM D3273-00 (2005) – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber*

2.13. *ASTM D3345-08 – Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites*

2.14. *ASTM D4226-11 – Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products*

2.15. *ASTM E2273-03 – Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies*

2.16. *ASTM C1363-11 – Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus*

3. Evaluation Scope:

3.1. This Technical Evaluation Report (TER) examines the use of Celect Cellular Exteriors cladding and trim when used:

3.1.1. As an exterior covering in accordance with *IBC* Section 1404 and 1405, and *IRC* Section R703.

3.1.2. To resist wind loads on walls in accordance with *IBC* Section 1609 and *IRC* Section R301.2.1.

3.2. This product is not intended for use in soffit applications. Use in this application is outside the scope of this TER.

4. Product Description and Materials:

4.1. Celect Cellular Exteriors cladding and trim is manufactured from foamed PVC vinyl. This foamed PVC cladding is available in one profile and 15 colors.

4.1.1. 7" Cedar profile in 12' 4" lengths (3.759 m) with “Gravity Lock” seams.

Figure 1: 7" Cedar Profile

4.2. Accessory trim products, such as inside and outside corners, window/door/frieze trim and other accessory items, are available and manufactured of the same material as the foamed PVC cladding. Starter strips are made of aluminum.

5. Applications:

5.1. General

5.1.1. Celect Cellular Exteriors cladding is used to provide an exterior weather-resistant covering for exterior walls in accordance with *IBC* Section 1404.9, Table 1405.2 and Section 1405.14, and *IRC* Section R703.1.1.

5.1.2. Material testing for code compliance is per *ASTM D3679*.

5.2. Wind Pressure Performance

5.2.1. Celect Cellular Exteriors cladding is also used in exterior wall assemblies to provide resistance to wind loads.

5.2.2. The cladding must be installed over rigid sheathing, such as wood structural panels, rigid foam sheathing or fiberboard.

5.2.3. It is not to be installed directly to the studs.

5.2.4. Celect Cellular Exteriors cladding is tested for wind resistance in accordance with *ASTM D3679/D5206*.

5.2.5. *IRC* wind pressure requirements:

> **R703.1.2 Wind resistance.** Wall coverings, backing materials and their attachments shall be capable of resisting wind loads in accordance with Tables R301.2(2) and R301.2(3). Wind-pressure resistance of the siding and backing materials shall be determined by ASTM E 330 or other applicable standard test methods. Where wind-pressure resistance is determined by design analysis, data from approved design standards and analysis conforming to generally accepted engineering practice shall be used to evaluate the siding and backing material and its fastening. All applicable failure modes including bending rupture of siding, fastener withdrawal and fastener head pull-through shall be considered in the testing or design analysis. Where the wall covering and the backing material resist wind load as an assembly, use of the design capacity of the assembly shall be permitted.

5.2.6. *IBC* wind pressure requirements:

> **1405.14 Vinyl siding.** Vinyl siding conforming to the requirements of this section and complying with ASTM D 3679 shall be permitted on exterior walls of buildings located in areas where V_{asd} as determined in accordance with Section 1609.3.1 does not exceed 100 miles per hour (45 m/s) and the building height is less than or equal to 40 feet (12 192 mm) in Exposure C. Where construction is located in areas where V_{asd} as determined in accordance with Section 1609.3.1 exceeds 100 miles per hour (45 m/s), or building heights are in excess of 40 feet (12 192 mm), tests or calculations indicating compliance with Chapter 16 shall be submitted. Vinyl siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

5.2.7. The design wind pressure for Celect Cellular Exteriors cladding is as shown in Table 1.

Product Name	Installation Method	Max Test Pressure (psf)[4]	PEF[1]	Maximum Design Pressure (psf)[2]	Maximum Design Wind Speed (V_{asd})[3]
7" Cedar	1 1/2" long, 0.125" shank, 0.375 head roofing nail – 16" o.c. (1" penetration into stud)	72	1.0	48	140

1. PEF = pressure gradient across cladding layer / total pressure gradient across wall, where 0 ≤ PEF ≤ 1.0
2. $D_p = P_t/PEF$ * Safety Factor (1.5)
3. IRC Table R301.2(2) – Wall Zone 5, Effective Wind Area = 10 square feet.
4. Testing conducted per *ASTM D5206*

Table 1: Maximum Design Wind Pressure & Wind Speeds

TABLE R301.2(3) HEIGHT AND EXPOSURE ADJUSTMENT COEFFICIENTS FOR TABLE R301.2(2)

MEAN ROOF HEIGHT	EXPOSURE		
	B	C	D
15	1.00	1.21	1.47
20	1.00	1.29	1.55
25	1.00	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.09	1.49	1.74
45	1.12	1.53	1.78
50	1.16	1.56	1.81
55	1.19	1.59	1.84
60	1.22	1.62	1.87

***IRC* Table R301.2(3)**

5.2.8. Example of how to use Table 1 and *IRC* Table R301.2(3): Can 7" Cedar Celect Cellular Exteriors cladding be used in 120 mph exposure C where the mean roof height is 20'?

5.2.8.1. The maximum design pressure for this cladding is 48 psf per Table 1.

5.2.8.2. The tabular maximum wind pressure from *IRC* Table R301.2(2) at 120 mph V_{asd} = -34.7

5.2.8.3. The multiplier for a mean roof height of 20' in Exposure C is 1.29 per *IRC* Table R301.2(3). 34.7 times 1.29 = 44.76

5.2.8.4. 7" Cedar profile Celect Cellular Exteriors cladding may be used. Note that it could also be used if the mean roof height is 25' (34.7 times 1.35 = 46.85).

5.3. Energy Performance

5.3.1. Celect Cellular Exteriors cladding may be used to provide insulation value per Table 2 in energy performance applications and is tested in accordance with *ASTM C1363*.

5.3.2. Celect Cellular Exteriors cladding U-factors may be used in conjunction with other insulation products to meet insulation U-factor wall assembly requirements in accordance with *IRC* Table N1102.1.3 and *IECC* Table R402.1.3.

Product Code	Test Report Per *ASTM C1363*	R-Value	U-Factor
7" Cedar	A6236.01-116-46-RO	1.57	0.64

Table 2: Celect Cellular Exteriors Cladding R-Value/U-Factor

5.4. Other Testing

5.4.1. Termite Resistance – Celect Cellular Exteriors cladding has been tested in accordance with *ASTM D3345*.

5.4.1.1. Celect Cellular Exteriors cladding: 0.76% weight loss, 9.0 visual block rating, light attack

5.4.1.2. Untreated Southern Yellow Pine reference sample: 10.4% weight loss, 7.0 visual block rating, moderate to severe attack

5.4.1.3. ACQ (0.25) treated Southern Yellow Pine reference sample: 2.9% weight loss, 9.9 visual block rating, sound

5.4.1.3.1. Visual block rating is on a scale from 10 to zero where 10 = surface is sound, nibbles permitted, 9 = sound, 7 = moderate attack with penetration, 4 = heavy and zero is failure.

5.4.2. Mold Resistance – Celect Cellular Exteriors cladding has been tested in accordance with *ASTM D3273*.

5.4.2.1. Rating 10 (100% clear) – no defacement at 4 weeks

5.4.2.1.1. Scale is from 10 to zero, with 10 being 100% clear, totally absent of disfigurement.

5.4.3. Combustibility Classification – Celect Cellular Exteriors cladding has been tested in accordance with *ASTM D635*.

5.4.3.1. No self-sustained burn beyond 30 seconds, corresponds to a Class CC1 product.

5.4.3.1.1. Test specimen was exposed to gas flame for 30 seconds, and then the flame was removed and the specimen examined for time and extent of burning. A zero mm/min linear burning rate corresponds to a Class CC1 product.

5.4.4. Applications subject to the *ICC Wildlife-Urban Interface Code* are outside the scope of this TER.

6. Installation:

6.1. Celect Cellular Exteriors cladding, trim and accessories shall be installed per the manufacturer's published installation instructions and this TER.

6.1.1. Manufacturer's published instructions are to be available at the jobsite at all times during installation.

6.1.2. Fasteners are to be corrosion resistant and of sufficient length to penetrate the wood studs not less than 1" (25.4 mm).

6.1.3. Studs used for fastening Celect Cellular Siding to the wall shall have a minimum specific gravity of 0.42.

6.1.3.1. Fasteners shall be placed as close as possible to the center of provided slots at 16" (406 mm) o.c.

6.1.4. Cladding shall be attached "loosely" to permit thermal movement. However, cladding courses shall be tightly nailed at the center of each run to distribute expansion and contraction evenly to each end.

6.1.5. Cladding shall be installed from left to right, due to the interlocking end joint design.

6.1.6. Cladding joints in courses should be staggered, avoiding joints above and below windows and doors to prevent moisture permeation and penetration.

6.1.7. Clearance must be supplied at the ends and top for trim design, to allow for thermal expansion at intersections with accessories per the installation instructions for Celect trim and site-built trim.

6.2. Celect Cellular Exteriors cladding and trim must be installed over rigid sheathing (wood, wood composite, rigid foam, OSB, fiber sheathing) sufficient to meet the applicable code provisions regarding wind load requirements.

6.2.1. Celect Cellular Exteriors cladding and trim shall not be installed directly to studs without a rigid sheathing applied.

6.2.2. A water-resistant barrier (WRB), as required by the code provisions, must be provided behind the cladding (*IBC* Section 1404.2 and *IRC* Section R703.2).

6.2.3. Flashing, as required by the code provisions, must be installed at all penetrations, abutments with dissimilar materials, and at cladding terminations (*IBC* Section 1405.4 and *IRC* Section 703.8).

6.3. Fasteners for Celect Cellular Exteriors cladding shall be as required by the code provisions (*IBC* Section 1405.14.1 and *IRC* Table R703.4), manufacturer's installation instructions and this TER.

6.4. Fastener requirements:

6.4.1. Corrosion-resistant (stainless steel or galvanized) nails or screws

6.4.2. Minimum head diameter of $^{3}/_{8}$" (0.375") (9.525 mm)

6.4.3. Nails must be long enough to penetrate studs a minimum of 1" (25.4 mm)

6.4.4. Screws must be long enough to penetrate a solid nailable surface a minimum of 1" (25.4 mm)

7. Test and Engineering Substantiating Data:

7.1. General testing for the Celect Cellular Exteriors cladding included in this report has been conducted in accordance with *ASTM C3679 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding*, conducted by ATI, Report Number A6846.01-106-31, 2013.

7.1.1. Weatherability testing to *ASTM C3679,* Sections 5.10 and 6.10, is a two-year process and is not required to be completed prior to marketing and sale of the product.

7.2. Thermal testing for the Celect Cellular Exteriors cladding included in this report has been conducted in accordance with *ASTM C1363 – Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus*, conducted by ATI, Report Number A6236.01-116-46, 2011.

7.3. Wind load testing for the Celect Cellular Exteriors cladding included in this report has been conducted in accordance with *ASTM D5026 – Standard Test Method for Windload Resistance of Rigid Plastic Siding*, conducted by ATI, Report Number A6846.01-106-31, 2013.

7.4. Termite resistance testing for Celect Cellular Exteriors cladding included in this report has been conducted in accordance with *ASTM D3345 – Standard Test Method for Laboratory Evaluation of Wood and Other Cellulosic Materials for Resistance to Termites*, conducted by ATI, Report Number A6846.01-106-31, 2013.

7.5. Mold resistance testing for Celect Cellular Exteriors cladding included in this report has been conducted in accordance with *ASTM D 3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber*, conducted by ATI, Report Number A6846.01-106-31, 2013.

7.6. Combustibility classification testing for Celect Cellular Exteriors cladding included in this report has been conducted in accordance with *ASTM D635 – Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position*, conducted by ATI, Report Number A6846.01-106-31, 2013

7.7. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate as it undertakes its engineering analysis.

7.7.1. DrJ has reviewed and found reasonable data provided by testing facilities but does not assume responsibility for the accuracy of data provided by testing facilities. DrJ relies on each testing agency's accuracy and accepted engineering procedures, experience, and good technical judgment

7.8. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through the codes and standards (e.g., *IRC*, *WFCM*, *IBC*, *SDPWS*, etc.), to undertake the review of test data that is comparative or shows equivalency to an intended end-use application.

7.8.1. DrJ does not assume responsibility for the accuracy of any code-adopted design values but relies upon their accuracy for engineering evaluation.

7.8.2. DrJ also relies on the fact that manufacturers of code-adopted products stand behind the legally established design values that have been created by the associations that publish code-defined design values for a given commodity product.

7.8.3. DrJ evaluates all equivalency testing and related analysis using this code-defined engineering foundation.

8. Findings:

8.1. *IBC* Section 104.11 and *IRC* Section R104.11 specifically state that:

> The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code.

8.2. When installed and fastened in accordance with this report, Celect Cellular Exteriors cladding and trim meet the exterior wall covering requirements as defined in this report and are code compliant for use on buildings built to the *IBC* and *IRC*.

9. Conditions of Use:

9.1. Where required by the jurisdiction in which the project is to be constructed, this report and the installation instructions shall be submitted at the time of permit application.

9.2. Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.

9.3. Loads applied shall not exceed those recommended by the manufacturer as follows:

9.3.1. Allowable wind loads do not exceed values in Table 1.

9.4. Celect Cellular cladding shall not be used as wall bracing to resist shear loads.

9.5. Manufacturer's installation instructions shall be shipped to the jobsite with the materials or otherwise be available on the jobsite for inspection.

9.6. Celect Cellular Exteriors cladding is extruded in Newbern, TN, and painted in Bristol, TN, under a quality control program with quality control inspections in accordance with *IRC* Section R109.2 and *IBC* Section 110.3.8 and 110.3.9.

9.7. Design

9.7.1. Building Designer Responsibility

9.7.1.1. The Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with *IRC* Section R106 and *IBC* Section 107.

9.7.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with *IRC* Section 301 and *IBC* Section 1603.

9.7.2. Construction Documents

9.7.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.

10. Identification:

10.1. Celect Cellular Exteriors cladding described in this TER is identified by a label on the cladding or packaging material bearing the manufacturer's name, product name, label of the third-party inspection agency, and other information to confirm code compliance.

10.2. Additional technical information can be found at celect.royalbuildingproducts.com.

11. Review Schedule:

11.1. This TER is subject to periodic review and revision. For the most recent version of this report, visit drjengineering.org.

11.2. For information on the current status of this report, contact DrJ Engineering.

Scope of Responsibility / Work, Operations Policies, and Legal Responsibilities

- Mission and Scope of Responsibility
- Product Evaluation Operations Concepts and Policies
- Legal Aspects of Product Approval